NOTICE OF PROPOSED AMENDMENT (NPA) No 04/2006

DRAFT DECISION OF THE EXECUTIVE DIRECTOR
AMENDING
DECISION NO. 2005/06/R OF THE EXECUTIVE DIRECTOR
of 12 December 2005 on
Certification Specifications for Large Aeroplanes (CS-25)

Symbolic Exit Signs And
Revised Standards for Cargo Compartments (D To C)

TABLE OF CONTENTS.

A. EXPLANATORY NOTE

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending Decision 2005/06/R of the Executive Director of 12 December 2005[1] . The scope of this rulemaking activity is described in more detail below.

2. The Agency is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation[2] which are adopted as "Opinions" (Article 14.1). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 14.2).

3. This rulemaking activity is included in the Agency's rulemaking programme for completion in 2006. It implements the rulemaking task 25.059 "Symbolic Exit Signs and Revised Standards for Cargo Compartments (D to C)".

4. The text of this NPA was originally developed by the JAA Cabin Safety Steering Group (CSSG) and later adapted by the Agency to conform to EASA regulations. It is submitted for consultation of all interested parties in accordance with Article 43 of the Basic Regulation and Articles 5(3) and 6 of the EASA rulemaking procedure[3].

II. Consultation

5. To achieve optimal consultation, the Agency is publishing this draft decision of the Executive Director on its internet site. As the content of this NPA was already agreed for adoption in the Joint Aviation Authorities (JAA) system and was the subject of a full worldwide consultation, the transitional arrangements of Article 15 of the EASA rulemaking procedure apply. This allows for a shorter consultation period of six weeks instead of the standard 3 months and exempts this proposal from the requirement to produce a ToR and full Regulatory Impact Assessment.

6. Comments on this proposal may be forwarded *(preferably by e-mail)*, using the attached comment form, to:

By e-mail: NPA@easa.eu.int

By correspondence: Process Support Unit
Rulemaking Directorate
EASA
Ref: NPA 04-2006
Postfach 10 12 53
D-50452 Cologne
Germany

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[1] Decision No 2005/06/R of the Executive Director of the Agency of 12.12.2005 on certification specifications, including airworthiness code and acceptable means of compliance, for large aeroplanes (« CS-25 »)

[2] Regulation (EC) No 1592/2002 of the European Parliament and of the Council of 15 July 2002 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency. *OJ L240, 7.9.2002, p.1.*

[3] Management Board decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ("rulemaking procedure"), EASA MB/7/03, 27.6.2003.

Comments should be received by the Agency before 7 June 2006. If received after this deadline they might not be treated. Comments may not be considered if the form provided for this purpose is not used.

III. Comment response document

6 All comments received in time will be responded to and incorporated in a comment response document (CRD). This may contain a list of all persons and/or organisations that have provided comments. The CRD will be widely available on the Agency's website.

The review of comments will be made by the Agency unless the comments are of such a nature that they necessitate the establishment of a group.

IV. Content of the draft decision

This NPA contains the following original JAA NPAs which have followed and completed the JAA consultation process:

i) JAA NPA 25D-327 "Symbolic exit signs as an alternative to red exit signs for passenger aircraft"
ii) JAA NPA 25D-320 "Revised Standards for Cargo or Baggage Compartments in Transport Category Aeroplanes"

For each of the above JAA NPAs four different parts have been constructed in this EASA NPA as follows:

I. Explanatory Note - Describing the development process and explaining the contents of the proposal.

II. Proposals - The actual proposed amendments.

III. Original JAA NPA justification - The proposals were already circulated for comments as a JAA NPA. This part contains the justification for the JAA NPA.

IV. JAA NPA Comment Response Document - This part summarizes the comments made on the JAA NPA and the responses to those comments.

B. JAA NPA 25D-327: Symbolic exit signs as an alternative to red exit signs for passenger aircraft (Final Version 3 March 2003)

I) Explanatory Note

(See also "A.I: General Explanatory Note")

1. For practical reasons, the initial issue of CS-25 was based upon JAR-25 at Amendment 16. During the transposition of airworthiness JARs into Certification Specifications, however, the rulemaking activities under the JAA system where not stopped and significant rulemaking proposals have since been developed. In order to assure a smooth transition from JAA to EASA, the Agency has committed itself to continue as much as possible the JAA rulemaking activities. It has therefore included most of the JAA rulemaking programme into its own plans. This EASA NPA is a result of this commitment and is based on JAA NPA 25D-327 which was circulated for comments from 1 February 2002 till 1 May 2002 and was adopted by the JAA-Committee on 12 September 2003.

2. This EASA NPA proposes the adoption of internationally recognised symbols used in buildings as an alternative to current red "exit" signs for aircraft cabins. It has been shown that the proposed symbols, already recognised world-wide in buildings, will increase passenger comprehension and thus enhance safety levels. The use of the symbolic exit sign option will be on a voluntary basis, but will have the benefit of simplifying the manufacturer's task of showing compliance with current national linguistic requirements whenever the symbolic sign option is used.

3. This proposal originates following reported difficulties by manufacturers of small aeroplanes in meeting the current exit sign lettering requirements whenever they have to accommodate two languages in exit sign units. Additionally, the need to produce various types of exit signs often in dual languages poses a logistical burden on the aeroplane manufacturer and also the owner of the aeroplane when sold to a country with a different language.

4. Exit signs designed with white symbols and green backgrounds, derived from ISO 3864, have been developed to suit four types of emergency signs defined in CS 25.812(b)(1)(i), (b)(1)(ii), (b)(2) and (e)(2). These were tested according to ISO 9186 procedures to an international travelling population speaking 61 different first languages. Resources devoted to the project since 1994, both from the Dutch RLD and French DGAC authorities, together with industry support in terms of engineering man-hours, has enabled a high degree of confidence to be gained in the project, with no major drawbacks identified throughout the CSSG evaluation process.

5. Since the development of the symbolic emergency exit signs contained in JAA NPA 25D-327 were first developed and tested, EASA is aware that international standards for signage have been further developed and that recent universal symbols found in buildings and other forms of public transport may now be at variance with those recommended in proposed AMC 25.812(b)(1). A search of published literature and advise given by specialists in this field, however, has been inconclusive in showing a clear safety benefit of any one particular design and evidence suggests that the general public will not differentiate between designs of a similar nature. Without clear evidence to the contrary, the designs originally proposed in JAA NPA 25D-327 are therefore retained in the guidance material. However, for clarity it is now stated that these are "example designs", and that other designs may be acceptable in showing compliance.

Comments are specifically requested on this issue.

II) PROPOSALS

The text of the amendment is arranged to show deleted text, new text or a new paragraph as shown below:

1. ~~Text to be deleted is shown with a line through it.~~
2. New text to be inserted is highlighted with grey shading.
3. New paragraph or parts are not highlighted with grey shading, but are accompanied by the following box text:

Insert new paragraph / part *(Include N° and title)*, or replace existing paragraph/ part

4. ….
   Indicates that remaining text is unchanged in front of or following the reflected amendment.
   ….

Book 1
SUBPART D DESIGN AND CONSTRUCTION

CS 25.811 Emergency Exit Marking

Amend existing CS 25.811(g) to read :

(g) Each sign required by sub-paragraph (d) of this paragraph may use the word ‘exit’ in its legend in place of the term ‘emergency exit’ or a universal symbolic exit sign (See AMC 25.812(b)(1), AMC 25.812(b)(2) and AMC 25.812(e)(2)). Mixing language signs and symbolic signs on the same aircraft is not allowed.

CS 25.812 Emergency lighting

1 - Amend existing CS 25.812(b)(1)(i) to read :

(i) Each passenger emergency exit locator sign required by CS 25.811(d)(1) and each passenger emergency exit marking sign required by CS 25.811(d)(2) must have red letters ~~at least 38 mm (1·5 inches) high~~ on an illuminated white background~~, and must have an area of at least 135 cm2 (21 square inches) excluding the letters. The lighted background-to letter contrast must be at least 10:1. The letter height to stroke-width ratio may not be more than 7:1 nor less than 6:1.~~or a universal symbol, of adequate size (See AMC 25.812(b)(1)). These signs must be internally electrically illuminated with a background brightness of at least 86 candela/m^2 (25 foot-lamberts) and a high-to-low background contrast no greater than 3:1.

2 - Amend existing CS 25.812(b)(1)(ii) to read :

(ii) Each passenger emergency exit sign required by CS 25.811(d)(3) must have red letters ~~at least 38 mm (1·5 inches) high~~ on a white background ~~having an area of at least 135 cm2 (21 square inches) excluding the letters.~~ or a universal symbol, of adequate size (See AMC 25.812(b)(1)). These signs must be internally electrically illuminated or self illuminated by other than electrical means and must have an initial brightness of at least 1.27 candela/m^2 (400 micro-lamberts). The colours may be reversed in the case of a sign that is self-illuminated by other than electrical means.

3 - Amend existing CS 25.812(b)(2) to read :

(2) For aeroplanes that have a passenger seating configuration, excluding pilot seats, of 9 seats or less, ~~that are~~ each sign required by CS 25.811(d)(1), (2) and (3) must have red letters ~~at least 25 mm (1 inch) high~~ on a white background ~~at least 51 mm (2 inches) high.~~ or a universal symbol, of adequate size (See AMC 25.812(b)(2)). These signs must be internally electrically illuminated, or self-illuminated by other than electrical means, with an initial brightness of at least 0.51 candela/m^2 (160 microlamberts). The colours may be reversed in the case of a sign that is self-illuminated by other than electrical means.

4 – Amend existing CS 25.812(e)(2) to read :

(2) Readily identify each exit from the emergency escape path by reference only to markings and visual features not more than 1.2 m (4 ft) above the cabin floor. (See AMC 25.812(e)(2)).

5 - Introduce new AMC 25.812(b)(1), AMC 25.812(b)(2) and AMC 25.812(e)(2) as follows :

AMC 25.812(b)(1)
Emergency Lighting

Two acceptable methods of demonstrating compliance with the requirement of CS 25.812(b)(1) are as follows:

A locator sign, marking sign and bulkhead or divider sign should either:

- have red letters at least 38 mm (1.5 inches) high on an illuminated white background, and should have an area of at least 135 cm^2 (21 square inches) excluding the letters. For locator and marking signs required by CS 25.811(d)(1) and (d)(2), the lighted background - to - letter contrast should be at least 10:1. The letter height to stroke-width ratio should not be more than 7:1 nor less than 6:1 ;

or,

- be a symbolic exit sign as derived from ISO/WD 3864-3 and ISO/CD 16069 "Safety Way Guidance System" and Draft BS 5499: Part 4 "Code of Practice for Escape Route Signing".

  The symbols should be white on a green background according to ISO 3864. The sign should have an area of at least 148 cm^2 (23 square inches) including white symbols. The lighted background-to-symbol contrast should be at least 1:10.

  For the symbolic sign required by CS 25.811(d)(2) (See Figure 2), the height of the symbols should be at least 38mm (1.5 inches).

  For the symbolic sign required by CS 25.811(d)(1) (See Figure 1) and for the symbolic sign required on each bulkhead or divider by CS 25.811(d)(3) (See Figure 3), the formula given in draft British Specification 5499 Part 4: "Code of practice for escape route signing", applies. The formula is as follows:

$D = Z \cdot a_s$ (where a_s and D have the same units)

Maximum viewing distance — Distance factor — Overall height of the symbolic sign

The maximum viewing distance "D" can be calculated from the overall height of the symbolic sign (a_s) by using the appropriate distance factor Z obtained from Table 1 below.

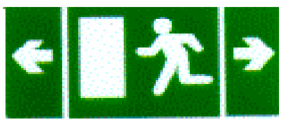
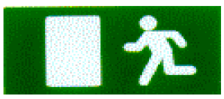
Table 1

Mean luminance of white contrast colour candela/m^2 (ft-L)	***Distance factor Z***
≥ 10 candela/m^2 (2.91 ft-L)	150
≥ 30 candela/m^2 (8.75 ft-L)	175
≥ 80 candela/m^2 (23.35 ft-L)	200
≥ 200 candela/m^2 (53.37 ft-L)	215
≥ 500 candela/m^2 (145.9 ft-L)	230

Note 1 : *The table given for reference is deduced from Table 2 in BS 5499.*

The maximum viewing distance "D" to be considered should be the maximum distance found between two adjacent exits on one side. If the minimum height calculated for the symbols is less than 38mm (1.5 inches), 38 mm (1.5 inches) should be taken.

Example designs of symbolic exit signs

CS 25.811(d)(1) (exit locator sign)	 FIGURE 1
CS 25.811(d)(2) (exit marking sign)	 FIGURE 2

CS 25.811(d)(3) (exit sign on bulkhead or divider)		FIGURE 3

AMC 25.812(b)(2)
Emergency Lighting

Two acceptable methods of demonstrating compliance with the requirement of CS 25.812(b)(2) are as follows:

A Locator sign, marking sign and bulkhead or divider sign must either:

- have red letters at least 25 mm (1 inch) high on an illuminated white background at least 51 mm (2 inches) high.

or,

- be a symbolic exit sign as derived from ISO/WD 3864-3 and ISO/CD 16069 “Safety Way Guidance System” and Draft BS 5499: Part 4 "Code of Practice for Escape Route Signing".

  The symbols should be white on a green background according to ISO 3864. The lighted background-to-symbol contrast must be at least 1:10. The height of the symbols should be at least 38 mm (1.5 inch).

AMC 25.812(e)(2)
Emergency Lighting

An acceptable method of demonstrating compliance with the requirement of CS 25.812(e)(2) regarding identifiers of floor level exits is to have a symbolic sign showing a white arrow on a green background as indicated in the figure.

Note: Mixing language signs with symbolic signs is not an acceptable method of demonstrating compliance with CS 25.812(b)(1), (b)(2) and (e)(2).

CS 25.812(e)
(exit identifier)

III) ORIGINAL JAA NPA PROPOSALS JUSTIFICATION

[Note: Where relevant, references to JAR-25 have been replaced by references to EASA CS-25]

1. SAFETY JUSTIFICATION / EXPLANATION

Safety impact

The proposal to allow the use of symbolic passenger emergency exit signs as an alternative to red "exit" signs will be beneficial to the safety of passengers as a picture is always more comprehensible than language. This is confirmed by a Crashworthiness Development Program Technical Group Report from AIA dated July 1968, which states: …*Another interesting finding was that the subjects did not appear to read the exit signs during evacuation. This finding indicates that for multi-lingual airlines, an exit locator and marking sign would be just as efficient, may be more so, if a universal exit sign was required… Apparently, in an emergency, the passenger goes to a source of light, not to the word "Exit*". Furthermore the universal passenger will not be at a loss to understand the emergency exit symbol because this is a universal design found worldwide in public buildings, and fully in line with international standards for safety colours. Red is for Stop and Prohibition; Green is for Safe Conditions and Means of Escape.

Another conclusion from the report above is that a green-coloured sign is significantly better than other colour configurations tested. This conclusion is corroborated by test data showing that a green-coloured symbolic sign is more visible than a red-coloured symbolic sign in smoke conditions.

Evaluation of the comprehensibility of symbolic signs

The symbolic signs, derived from ISO 3864, were tested in two phases (Schiphol 1995 and 1996)[4] according to ISO 9186 procedures, with questionnaires established by Cranfield University (UK) and administered by Mobiel Centre (NL), to an international travelling population speaking 61 different first languages, and in October 1998 by the French Company NEC S.A. in Paris[5], which specializes in on-board human-machine interfaces and lightings.

In addition, questionnaires circulated within the CSSG in January 1999 confirmed a preference for white figures/green background for the three typical marking signs high in the cabin and for the symbolic exit "identifier" of the floor-proximity system. Compliance with the brightness requirements of CS 25.812 was shown with the white symbol providing the most illuminated portion of the sign.

By early March 2000, following a CSSG recommendation, the symbolic exit sign lighting level was successfully compared with the building minimum condition contained in BS 5499 "Code of Practice for Escape Route Signing". In BS 5499 and EN 1838 specifications, a formula scientifically establishes for symbolic exit signs the relationship between the viewing distance and the height of the sign at given luminance levels. The analysis found a good correlation between the height of symbolic exit signs found on two aeroplane models looked at (ATR 72 and A300/A340) and building minimum standards. With some conservatism brought in to the calculation of the

[4] Details on the comprehensibility survey made on behalf of the JAA CSSG in 1995 and 1996 are found in Cranfield University College of Aeronautics Report No 9706 - April 1997.

[5] Ref. NEC S.A. Qualification Test Report No. 800-0098 at issue D dated 26/12/00

minimum symbolic sign height, the BS 5499 formula was therefore agreed by the CSSG WG to serve as the design standard for the proposed symbolic exit signs.

As a result of the studies undertaken, the CSSG concluded that the symbolic sign designs which indicate the actual location of the exit, CS 25.811(d)(1) and CS 25.811(d)(2), are sufficiently understood by the travelling public to be put into use. The CSSG further concluded that the symbolic sign depicting exit(s) further down the aisles, CS 25.811(d)(3), despite failing to meet the 66 % comprehension criteria of ISO 9186, demonstrated the greatest comprehension among the 4 alternatives tested and has significantly greater comprehension than the existing language sign. The symbolic "arrow" sign, retained by the JAA CSSG for Exit identifiers as part of the floor proximity escape path marking, is considered to be the most self-explanatory concept and the brighter sign as regards the relatively small room available to accommodate the required exit identification information.

Applicability

Symbolic signage can be used on a voluntary basis. Mixing of language signs with symbolic signs on the same aeroplane is not permitted.

2. COST / SAFETY BENEFIT ASSESSMENT

Language sign and symbolic sign units will be similar in size to allow for the use of either method on new build aeroplanes and to facilitate the possibility of retrofitting symbolic signs into existing aeroplanes without modification to sign units and trim panels, etc. This should be an advantage from the cost point of view and will simplify the manufacturer’s task regarding the procurement and management of these items.

IV) JAA NPA COMMENT-RESPONSE DOCUMENT (3 March 2003)

[Note: Where relevant, references to JAR-25/ACJ have been replaced by references to EASA CS-25/AMC.]

Comments were provided by 9 different organisations/Authorities/persons. Four agree with the proposals without comments; the remaining comments have been reviewed by the JAA CSSG and collected per category of comment.

Full consensus on the disposal of comments has been reached within the group. The EASA has reviewed the JAA CRD in the course of developing this NPA, and comments are added where EASA is not in full agreement with the CSSG.

1. Comments related to proposed CS 25.812(b)(1)(i), (ii) and (b)(2) "…have letters or a universal symbol all coloured of adequate size."

Comments n° 003, 008, 009 & 011 propose a different wording for the added sentence: "…have letters or a universal symbol all coloured of adequate size."

Main reason for change is: clarification.

CSSG recommendation:
It is recommended to follow the proposals, shared by a significant number of commentators, and replace the existing sentences by:

> "…have coloured letters, or a coloured universal symbol, of adequate size."

EASA Comment
EASA were not in favour of this wording, as it introduces the possibility of emergency "exit" signs with other than red letters on a white background being introduced. As this was not the intent and EASA sees no safety benefit in such a change, it is appropriate that reference to the colour of letters is retained in the rule.

2. Comment related to the use of imperatives such as "must", shall" and "should", and the fundamental question whether part of the proposed AMC text should not be put in Section 1.

Comment n° 003 points out in AMC 25.812 an inconsistency in the use of verbs like must, shall, should. Additionally, the commenter finds that if it is considered necessary to require exit signs to conform to the technical specifications currently proposed under AMC 25.812, then they should be adopted in Section 1 material.

CSSG recommendation:
It is proposed to only use the verb "should" in the text of AMC 25.812, because it contains Interpretative Material. According to the current generic views on location of the technical specifications, the AMC is the appropriate location.

EASA Comment
The verb "must" is used to conform to normal EASA terminology.

3. Proposals for consistency and grammatical correctness

Comment n° 014 proposes a series of corrections for consistency, clarity and grammatical correctness. A comment that was not in the formal package of comments to NPA 25D-327 regarding a typing error in proposed AMC 25.812(b)(2) "have red letters at least 1 inch high", which must be "have red letters at least 1.5 inch high", has been included as well.

CSSG recommendation:
It is recommended to apply the proposed corrections.

EASA Comment
The correction proposed here is not understood. For aeroplanes with a passenger seating capacity of 9 or less, CS 25.812(b)(2) stipulates a 1 inch high sign. The original text was therefore believed to be correct and is retained in this NPA.

4. Proposals related to the sentence "the colours may be reversed in the case of a sign that is self-illuminated by other than electrical means" in the proposed CS 25.812(b)(1)(ii) and (2)

Comments n° 010 & 012 propose to remove the sentence "the colours may be reversed in the case of a sign that is self-illuminated by other than electrical means" from the requirement text because colours are not specified.

CSSG recommendation:
This sentence is a generic statement for which colours do not need to be specified, it applies to a self-illuminated sign with comparison to an electrically illuminated sign whatever the specified colours are. Therefore, it does not appear necessary to delete this sentence from the requirement text.

5. Comments related to the implementation of symbolic exit signs

One commenter considers that the method of implementation is a critical aspect which has the potential of resulting in a safety disbenefit. Pertinent issues include: phase-in protocol and period, combination of "exit" and symbolic signs in the fleet, within individual carrier's fleets, on same/similar-model airplanes and on individual aircraft, and passenger "training".

CSSG recommendation:
The intent of the NPA was to limit the number of different dual language "exit" signs currently in use in many countries, so the use of universally understandable symbolic exit signs (as shown in the surveys done in preparation of the NPA) will improve the situation that was described by the commenter. The variations between aircraft in the use of different exit signs is considered to be of no negative influence, taking into account the wide variation in exit signs in buildings, ships and trains.

6. Proposals related to mandating the use of symbolic exit signs on all aircraft

Comment n° 013 suggests to broaden applicability by mandating use of symbolic signs on all aircraft in Europe.

CSSG recommendation:
This is in contradiction with the intent of NPA 25D-327 that is to offer an alternative to the existing rules. Creating a requirement for use of green symbolic signs would lead to dis-

harmonization. The need for a requirement for symbolic exit signs needs to be evaluated in the future.

7. Proposals related to retroactive applicability

Comments n° 001, 002 & 005 consider that JAR-26 should be updated in accordance with the NPA both for consistency reason and promoting use of the NPA by operators.

CSSG recommendation:
There is no objection for updating JAR-26 in accordance with NPA 25D-327.

C. JAA NPA 25D-320: Revised Standards for Cargo or Baggage Compartments in Transport Category Aeroplanes (Final Version dated 4 December 2002)

I) Explanatory Note

(See also "A.I: General Explanatory Note")

1. For practical reasons, the initial issue of CS-25 was based upon JAR-25 at Amendment 16. During the transposition of airworthiness JARs into Certification Specifications, however, the rulemaking activities under the JAA system where not stopped and significant rulemaking proposals have since been developed. In order to assure a smooth transition from JAA to EASA, the Agency has committed itself to continue as much as possible the JAA rulemaking activities. It has therefore included most of the JAA rulemaking programme into its own plans. This EASA NPA is a result of this commitment and is based on JAA NPA 25D-320 which was circulated for comments from 1 April 2001 till 1 July 2001, was agreed for adoption by the JAA Regulation Sectorial Team in March 2003, but was never published by the JAA.

2. Due to a number of fires in the cargo or baggage compartments of transport category aeroplanes in recent years, some of which having resulted in accidents and loss of life, on 19 March 1998 the FAA issued FAR 25 Amendment 25-93 and FAR 121 Amendment 121-269 based on NPRM 97-10. These amendments upgrade the fire safety standards for cargo or baggage compartments in certain transport category aeroplanes by eliminating Class D compartments as an option for future type certification. It also requires that Class D compartments in certain transport category aeroplanes already in service and used in passenger service, must be modified to meet the fire or smoke detection and fire suppressions standards for Class C compartments. The Class D compartments in certain transport category aeroplanes manufactured under existing type certificates and used only for the carriage of cargo must also meet such standards or the corresponding standards for Class E compartments.

3. After the publication of the FAA final rule, the JAA HQ mandated the CSSG to review the matter and, if supported, to prepare similar requirements for implementation into the JAR codes. During the discussion within the CSSG a general consensus was reached for adoption of FAA Amendment 25-93 into CS-25 and NPA 25D-320 was produced.

4. This EASA NPA builds on the work previously done by the JAA and proposes an amendment to CS-25 to enhance design standards for new aeroplanes. In addition, an amendment to JAR-26 was also proposed by the JAA to align with FAR 121 Amendment 121-269. This proposal is currently under review by the JAA.

II) PROPOSALS

The text of the amendment is arranged to show deleted text, new text or a new paragraph as shown below:

1. ~~Text to be deleted is shown with a line through it.~~
2. New text to be inserted is highlighted with grey shading.
3. New paragraph or parts are not highlighted with grey shading, but are accompanied by the following box text:

Insert new paragraph / part *(Include N° and title)*, or replace existing paragraph/ part

4. ….
   Indicates that remaining text is unchanged in front of or following the reflected amendment.

….

Book 1
SUBPART D DESIGN AND CONSTRUCTION

CS 25.855 Cargo or Baggage compartments

Amend existing CS 25.855(c) to read:

………….
(c) ceiling and sidewall liner panels of Class C ~~and D~~ compartments must meet the test requirement of Part III of Appendix F or other approved equivalent methods.
………….

CS 25.857 Cargo Compartment Clarification

Amend existing CS 25.857 by deleting the text of sub-paragraph (d) and replacing it with "[Reserved]"

(d) ~~*Class D*. (See AMC 25.857 (d).) A Class D cargo or baggage compartment is one in which –~~
~~(1) A fire occurring in it will be completely confined without endangering the safety of the aeroplane or the occupants;~~
~~(2) There are means to exclude hazardous quantities of smoke, flames, or other noxious gases, from any compartment occupied by the crew or passengers;~~
~~(3) Ventilation and draughts are controlled within each compartment so that any fire likely to occur in the compartment will not progress beyond safe limits;~~
~~(4) Reserved.~~
~~(5) Consideration is given to the effect of heat within the compartment on adjacent critical parts of the aeroplane.~~
~~(6) The compartment volume does not exceed 28.32 m3 (1000 cubic ft).~~
~~For compartments of 14.16 m3 (500 cubic ft) or less, an airflow of 42.48 m3/hr (1500 cubic ft per hour) is acceptable~~
~~For compartments of 14.16 m^3 (500 cubic ft) or less, an airflow of 42.48 m^3/hr (1500 cubic ft per hour) is acceptable.~~ .
[Reserved]

CS 25.858 Cargo or Baggage Compartment Smoke or Fire Detection Systems

Amend CS 25.858 to read as follows:

If certification with cargo or baggage compartment smoke or fire detection provisions is requested, the following must be met for each cargo or baggage compartment with those provisions:

a) …
b) …
c) There must be means to allow the crew to check in flight, the functioning of each smoke or fire detector circuit.
d) …

III) <u>ORIGINAL JAA NPA PROPOSALS JUSTIFICATION</u>

[Note: Where relevant, references to JAR-25 have been replaced by references to EASA CS-25]

The scope of this JAA NPA was to harmonise CS-25 with FAR Part 25. Justification for the rule change provided by the FAA, together with a complete economic impact evaluation, can be found in the FAA final rule associated with Amendment 25-93, and is provided in the attachment to this NPA.

IV) <u>JAA NPA COMMENT RESPONSE DOCUMENT</u> (4 December 2002)

Comments were provided by 19 different organisation/Authorities. Five out of nineteen (SLV Denmark, DCA Malta, CAA-UK, LFV-S and Austro Control) have no comments or support the new requirements adoption; the remaining comments have been reviewed and collected paragraph by paragraph.

"Disposal of Comment Sheet" has been fulfilled for each requirement; the comment itself, the group position and relevant rationale have been recorded for each item of concern and the final group proposal has been added as well.

Many comments are related to the TGM/25/09 (Built In Fire Extinguishant Systems). The NPA however does not mention it at all and the comments have been considered out of the scope of this NPA. It is worthy of note that the CSSG considered that some comments have merit and should be taken into account for future JAA-FAA harmonisation activities on this matter.

<u>EASA Note.</u>

The requirements of CS 25.851(b): Built-in fire extinguishers, was subject to harmonisation under the JAA/FAA "Better Plan for Harmonisation". Under this procedure, CS 25.851(b) was identified as a "Category 1" item, and harmonisation was agreed using the "enveloping" process which adopted the more severe position of the then JAR-25 and FAR Part 25 requirements. JAA NPA 25D-316, which was based on the recommendations from the Mechanical Systems Harmonisation Working Group, inter alia, proposed this change, which was then subject to public consultation and subsequent adoption by the JAA Regulation Sectorial Team. However, it did not complete the process in time for adoption in the initial issue of CS-25. EASA currently has rulemaking task 25.010: Doors and Mechanical Systems on its 2006 Rulemaking Programme, which includes this issue and aims to complete the rulemaking procedure and publish an amendment to CS-25 in 2006. EASA issued NPA 02/2006 on this subject on 10th March 2006.

Full consensus on the disposal of comments has been reached within the group.

CSSG NPA 25D-320 PROCESS OF COMMENTS			
Para:	*Title:*		
N.P.A. 25D-320 Text: See NPA 25D-320			
First Comment: KLM UK Ltd			
Text: There should be a five years period allowed between adopting the rule and installation of the modification.			
Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☐
Rationale: The rules are applicable to new models; the implementation period is not relevant to this NPA.			
Second Comment: ERA			
Text: Para 26.155-sub-paragraph (c) (c) After (5 years after the implementation date.			
Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☐
Rationale: The rules are applicable to new models; the implementation period is not relevant to this NPA.			
Proposal: *Retain the present NPA text.*			

CSSG NPA 25D-320 PROCESS OF COMMENTS						
Para:			*Title:*			
N.P.A. 25D-320 Text: See NPA 25D-320						
First Comment: KIDDE Aerospace						
Text: We recommend that the JAA consider the FAA "lessons learned" with respect to the definition and the certification of Class D to C cargo smoke detection & fire suppression systems impacted by the 19 march 1998 JAR implementation. The European Airlines are largely reluctant to procure and install existing FAA approved Class D to C cargo smoke detection & fire suppression systems due to the possibility of technical differences in the JAA and FAA systems: These technical differences can be categorised as: 1. Flight Test Certification Smoke Generation-approved sources and smoke output levels. 2. Halon Concentration Measurements-point to point versus averaging method 3. Halon Flight Test profile-cruise ar cruise and descent 4. Halon System Sizing- for worse case model temperature/pressure/leakage rate or test aircraft 5. Flight Deck System Controls-human factors issues such as placement, supplemental indicators, and aural sounders 6. The use of math models and cargo bay simulation labs to certify model variants 7. Regulatory approval to release halon on certification test flights or alternate agent substitution. The technical issues above, if specified differently from the previous FAA certified systems, or left unspecified will result in increased system hardware and re-certification costs.						
Accepted ☐		Partially Accepted ☐		Rejected ☐		Noted ☑
Rationale: The comments could affect means of compliance or interpretative material and not the rule itself.						
Rationale: New rules are applicable to new models; the implementation period is not relevant to this NPA.						
Proposal: *Retain the present NPA text.* The comments have some merits and the group support these comments to be addressed to the Mechanical Systems Harmonisation Working Group.						

CSSG NPA 25D-320 PROCESS OF COMMENTS

Para:	*Title:*		
N.P.A. 25D-320 Text: See NPA 25D-320			
First Comment: Britannia Airways Ltd.			
Text: The JAA interpretation of required Halon concentration should be fully harmonised with that of the FAA			
Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☑
Rationale: TGM/25/09 not relevant to the NPA. The new rule does not address either the acceptable means of compliance or the interpretative materials. The Halon concentration level issue has been harmonised within the Mechanical System Harmonisation Working Group.			
Second Comment: JMC Airlines Ltd.			
Text: The requirement for Halon concentration should be as per the FAA requirement and not the proposed revised JAA interpretation.			
Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☑
Rationale: TGM/25/09 not relevant to the NPA. The new rule does not address either the acceptable means of compliance or the interpretative materials. The Halon concentration level issue has been harmonised within the Mechanical System Harmonisation Working Group			
Third Comment: KIDDE Aerospace			
Text: We recommend that the JAA consider accepting FAA approved Class D to C cargo smoke detection & fire suppression system supplemental type certificates (STCs) as well as FAA approved OEM type certificate modification systems (Service Bulletins Systems) “as is” with no additional JAA imposed type certification efforts or any other additional requirements for all such systems that have been ordered or installed by European Airline operators prior to the effectivity of the new JAA regulation.			
Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☑
Rationale: TGM/25/09 not relevant to the NPA. The new rule does not address either the acceptable means of compliance or the interpretative materials. The Halon concentration level issue has been harmonised within the Mechanical System Harmonisation Working Group			

Fourth Comment: AEA.

Text:

The JAA interpretation on halon concentration should be fully harmonised with the applicable FAR requirements (re: JAA TGM/25/09 titled "Built in Fire Extinguishant Systems: extinguishant concentration levels in Class C&D Cargo Compartments)

Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☑

Rationale:

TGM/25/09 not relevant to the NPA. The new rule does not address either the acceptable means of compliance or the interpretative materials. The Halon concentration level issue has been harmonised within the Mechanical System Harmonisation Working Group

Fifth Comment: Scandinavian Airlines System

Text:

1. The FAA 3% average concentration approved under the current FAR's must be adopted by the JAA. Given current understanding of what really happens in a lower deck cargo compartment, increasing the level, and therefore the amount of Halon, will simply not appreciably increase the level of cargo compartment fire safety.
2. Increasing the amount of Halon carried out by each aircraft operating under the current JAA requirements is running contrary to each operator's commitment to reduce and eliminate of this ozone depleting environmental hazard. Halon amounts must be reduced or kept to the absolute minimum.

Accepted ☐	Partially Accepted ☐	Rejected ☑	Noted ☑

Rationale:

TGM/25/09 not relevant to the NPA. The new rule does not address either the acceptable means of compliance or the interpretative materials. The Halon concentration level issue has been harmonised within the Mechanical System Harmonisation Working Group

Proposal:

Retain the present NPA text.

Attachment – FAA Regulatory Evaluation. Extract from the Final Rule (Amendment 25-93) published on 17 February 1998

Regulatory Evaluation Summary

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Third, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these analyses, the FAA has determined that this rule: (1) will generate benefits that justify its costs and is a “significant regulatory action” as defined by Executive Order 12866; (2) will have a significant impact on a substantial number of small entities; and (3) will not constitute a barrier to international trade. The FAA has also determined that this rule is “significant”' according to DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979) because there has been considerable public interest in this subject. These analyses, available in the docket, are summarized below.

Discussion of Comments Related to the Economic Analysis

Comments related to the economic analysis can be grouped as follows: (1) comments addressing specific benefit or cost assumptions, (2) comments recommending a reduction in the compliance time, (3) comments requesting an increase in the compliance time, (4) comments calling for the expansion of detection and suppression requirements, (5) comments requesting that some operations be excepted from detection and suppression requirements. The last four groups of comments are addressed elsewhere in the preamble. What follows is a discussion of comments specifically addressing the economic assumptions.

At least one commenter raised questions regarding the inclusion of non-domestic aviation incidents, such as the Gulf Air and Saudi Arabian incidents, for purposes of developing a quantified estimate of the benefits of the rule. The FAA believes that it is reasonable to include the Gulf Air and Saudi Arabian incidents in the calculation of quantified benefits. Some may argue that these incidents are not pertinent. However, a careful examination of these accidents by FAA security and other safety experts concluded that nothing about the causes of those accidents could be classified as risks that are inherently different from U.S. risks. Thus, the FAA believes that the circumstances that caused both the fires and the deaths could occur in U.S. operations. Another alternative analysis just relying on domestic incidents could also have been done. If the two foreign accidents were not counted, of course, the total benefits quantified in the Regulatory Evaluation for this rule might be lower. However, the FAA believes that, even without considering the foreign accidents, the quantified and non-quantifiable benefits (such as the potential for increased future risk resulting from the proliferation of aerosol cans using flammable propellants) are sufficient to justify the costs of this rule. Moreover, there are other potential benefits that the FAA did not quantify, such as those fortuitous domestic cases in which the passengers and crew just barely escaped with their lives from fires initiated in Class D compartments.

Detection and Suppression Unit Cost Estimates. Few commenters provided cost estimates; most referred to cost figures from the preliminary regulatory evaluation. One major carrier, however, provided detailed detection and suppression cost estimates (for two affected airplane models) that were substantially lower than FAA estimates. Even after including out-of-service costs (which the FAA estimates do not include for reasons discussed elsewhere in the preamble) the commenter's unit cost estimates were approximately equal to -- and in one case lower than -- those calculated by the FAA. This is consistent with anecdotal evidence gathered by the FAA since the publication of Notice 97-10: competitive forces have in many cases significantly bid down retrofit costs. From this evidence, the FAA concludes that the original cost assumptions (which are maintained in the final regulatory analysis) and benefit-cost findings are conservative.

The Cost of Diversions. One commenter interpreted the economic analysis to imply that the FAA believes the costs associated with a false alarm are approximately $60 to $2,800 per event. ``Assuming that each of our fleet types would incur one additional diversion per year," this commenter writes, ``the cost is estimated to be $30,000 for a 727 and $50,000 for a DC-10." ``Consequently," the commenter concludes, ``the costs per diversion of $60 to $2,800 are not valid estimates."

The FAA agrees that the cost per division is in the range suggested by the commenter -- in fact, this is consistent with the diversion cost assumptions used in the preliminary regulatory evaluation. In any given year, however, most airplanes will not experience a diversion. The $60 to $2,800 range is a calculation of the annualized false alarm costs per airplane -- that is, the cost of a diversion weighted by the annual probability of a diversion.

It is also worth noting that the regulatory evaluation accounts for the fact that the false alarm rate exhibited by detectors installed as result of this rule will be lower than the historical false alarm rate. Current-generation detectors, for example, make use of microprocessor technology that permits the system to discriminate between fire-generated smoke and other non-hazardous particulates (water vapor, for example).

Downtime Costs. Several commenters contend that the rule will require significant downtime, and, concomitantly, result in substantial lost revenue. The Air Transport Association estimates that "*it will cost $22,400 per airplane more to complete the program on a 3-year schedule compared to a 5-year schedule. For a fleet of 2,994 passenger airplanes and 321 all-cargo airplanes [figures contained in Notice 97-10], the excess cost would be over $74 million.*" "*We do not think,*"' ATA concludes, "*that the marginal added benefits resulting from a 3-year schedule justifies the extra cost.*" The comment does not include specific details as to how the per-airplane cost estimate was derived.

As noted earlier, the FAA has given considerable thought to the option of extending the compliance deadline. Based on the information received in the comments, however, the FAA still believes that a three-year compliance schedule is the optimal compromise between cost and safety considerations. First, as noted earlier, design approval has already been granted for the installation of detection and suppression systems in some of the more numerous airplane models in service with Class D compartments. The comments provide no additional information that causes the FAA to alter its conclusion that fleetwide compliance can be achieved without additional downtime.

Second, the FAA believes that revenue loss estimates provided by the airline industry are overstated. This follows since total industry losses cannot be calculated by multiplying net revenue loss (revenue minus variable operating costs) per airplane-day by the total number of down-days (the methodology apparently used in the ATA comment). While it is true that at different times during the compliance period individual airlines will be affected to varying degrees, overall airline competition is approximately a constant-sum contest for passengers. That is, most passengers unable to book a flight of first preference (assuming aircraft unavailability as a result of this rule) will book another flight on the same or a competing airline. The fact that competition in many markets encourages airlines to increase schedule frequencies, even if available seats are plentiful, further mitigates the possible impact to the industry as a whole.[*]

Installation Labor Costs. One foreign air carrier stated that C-check work for its fleet is broken down into a number of smaller units and accomplished over a longer period of time; therefore, it is likely that some airplanes will not have a 5-day downtime period for scheduled maintenance. (The proposed rulemaking would not be directly applicable to the foreign carrier; however, the comment is noted for illustrative purposes.) According to the commenter, this is likely to lead to unscheduled downtime. In addition, the commenter notes ``the estimated 30% reduction in labor hours, allowed in Notice 97-10 due to `existing' access,'' does not apply. Comments relating to additional downtime costs are addressed above. The FAA did note in the notice that scheduling the cargo compartment retrofit to coincide with scheduled maintenance could lower work hours by approximately 30%. The actual retrofit cost estimates, however, were not adjusted to account for this savings -- this observation was made only to show that installation costs were conservatively estimated.

Summary of Final Analysis

This analysis separately considers newly-manufactured airplanes and in-service airplanes. There are 21 transport-category airplane models operating under 14 CFR part 121 that have Class D compartments. Airplanes that are expected to be permanently retired from service before the year 2001 (the assumed compliance deadline), are omitted from the analysis. Based on changes proposed in this rule, the FAA now estimates that 2,991 passenger airplanes and 313 all-cargo airplanes will be affected by the rule. These estimates are based on an inventory compiled by the FAA's National Aviation Safety Data Analysis Center (NASDAC) from airplane-specific registry and insurance records.

Cost Estimates

Cost estimates consider: (1) the costs associated with submitting compliance reports, (2) certification expenses including one-time equipment and tooling costs, (3) fire detection and suppression equipment and installation costs, and (4) variable operating costs (fuel costs, maintenance and inspection costs, weight off-load costs, and the costs associated with unnecessary diversions initiated because of false alarms). In addition, it is assumed that Class D compartments in all-cargo airplanes will be converted to E compartments which do not require the installation of active suppression systems.

The proposal will require each affected operator to submit a quarterly report listing the serial numbers of those airplanes in its fleet that are in compliance with the provisions of the rule and those that are not in compliance. One major carrier stated that, since records of modifications of this

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[*] It should be noted that this observation is not inconsistent with the “overbooking”' phenomenon. See, for example, Crandall, Robert L., “The Unique U.S. Airline Industry”, in the Handbook of Airline Economics, McGraw-Hill, 1995, p. 4. “The influence of even small differences in departure time on customer buying behavior creates a powerful incentive for carriers to increase frequency, even when there are plenty of seats available on existing flights . . . [T]he fact that more capacity represents more frequency -- and thus a more desirable product -- gives every airline an incentive to use every airplane as intensively as possible. While this strategy makes sense for each individual carrier, it produces a tendency toward perpetual oversupply.”

scale are computerized, the reporting requirement will involve less than one-half of one work hour. Initially, however, reports may take additional time to generate as carriers establish procedures, forms, etc. Also, records may not be computerized for smaller carriers. Thus, FAA conservatively estimates that, on average, the rule will require two additional work hours per quarter for each of the approximately 130 affected carriers. Assuming that each carrier will file 11 reports during the three year compliance period and that the fully burdened hourly compensation rate is $65, the estimated nominal cost of this provision to the entire industry is approximately $186,000 or $151,000 at present value (printing, postage, and other miscellaneous costs are assumed negligible).

The FAA will also incur additional costs as a result of this reporting requirement. This analysis conservatively assumes that each of approximately 90 Flight Standards District Offices (FSDO) will, on average, spend approximately one-half of one work hour per quarter processing air carrier reports (some will spend no time, some considerably more than one-half hour). Also, approximately 20 hours per quarter will be required at FAA headquarters to tabulate these reports. Assuming the fully burdened hourly compensation rate is $38, the estimated nominal cost of this provision to FAA is approximately $27,000 or $22,000 at present value (data transmission costs between FAA headquarters and each of the FSDO's is assumed negligible).

Type design approval of the detection and suppression systems will be required for most airplane models affected by the proposal. Type design approval will be in the form of a supplemental type certificate (STC) issued to an applicant other than the manufacturer; or, in the case of the manufacturer, either an STC or an FAA-approved type-design change. (The requirements for obtaining FAA approval are the same in either case.) The FAA assumes that type-design approval will be required for all airplane models affected by the proposed rule. Certain models will require a separate type-certification program for each different variant, while in other cases, all variants will be sufficiently similar that type-design approval could be granted for all variants following only one type-certification program. In some instances, an alternate Class C compartment configuration has already been FAA-approved. For those models or variants, no further type-certification effort will be required.

The cost of a type-certification program of this nature ranges from $315,000 to $1.8 million depending on the airplane model. In principle, no more than one type-certification program will be needed per model or variant; since operators could elect to utilize the same detection and suppression system installations on all affected airplanes of that particular type. If additional entities obtain separate type-design approvals for a given model or variant, they will do so for economic gain, not as a result of an FAA requirement to do so. Therefore, the analysis assumes the minimum number of type-certification programs theoretically necessary to accomplish the conversions.

Detection-suppression system and installation cost estimates postulate that compartments will be fitted with a system of optical smoke detectors (configured to give indication of a fire within one minute) and a halon suppression system. The analysis further assumes a quantity of halon that will provide: (1) an initial ``knockdown'' discharge, and (2) the capability subsequently to maintain a 3 percent halon concentration for one hour. This is consistent with the standards currently in effect for Class C compartments.

Although the U.S. bans the import of newly-produced halon, sufficient quantities of recycled halon are known to be available to meet the additional demand generated by this rule. The cost of halon has risen from approximately $2 per pound before production was banned to $20 per pound currently. This analysis assumes that halon used in a retrofit will be available at $20 per pound. Nominal equipment and installation unit (i.e. each airplane) costs range from $13,000 to $101,000 depending on the airplane model.

Although the time to retrofit could be substantial, especially for airplanes with three Class D compartments, industry representatives state that conversions could be accomplished during a C-check, a scheduled maintenance check that occurs about once a year. C-checks are typically accomplished over a four- to five-day period. Conversions conducted concurrent with a C-check could reduce labor hours by as much as 30 percent, because many areas of the airplane are easily accessible. As noted previously, the comments received by the FAA do not provide any credible reasons that detection and suppression systems cannot be installed in all affected airplanes within three years while the airplanes are undergoing other scheduled maintenance. Therefore, this analysis attributes no foregone revenues due to downtime (i.e., time out-of-service) associated with these conversions.

Depending on the airplane model and its configuration, installing fire suppression and detection systems will add between 7 and 300 pounds to the empty weight of an airplane. This weight, in turn, will affect fuel consumption. Incremental fuel consumption costs were estimated for each airplane model based on the weight of additional equipment and suppression agent required, statistical estimates of the change in fuel consumption as a function of incremental weight by airplane type, and estimates of annual flight hours by airplane model. Annual per-airplane incremental fuel consumption estimates range from $50 to $4,900 depending on the airplane model.

Inspection and maintenance of fire detection and suppression systems will include: (1) a leak check; (2) a visual inspection of the system; (3) a sensor test; and (4) a hydrostatic check of the fire bottles. The first three checks could be accomplished at each C-check, i.e., about once per year. A hydrostatic check will involve removing and replacing the fire bottle and will occur approximately once every five years. The bottle would be returned to the halon provider where it would be recharged and checked for leaks.

Six work-hours at a burdened hourly rate of $60 will be required to conduct a leak check of the system of each compartment. A visual inspection of the system will require 1.5 hours per compartment at $60 per hour. Checking the sensors will require about one hour per compartment. It will take two mechanics one hour at a burdened hourly rate of $60 to remove and replace a fire bottle. Fire-bottle vendors typically charge between $600 and $1,000, including shipping, to perform a hydrostatic test and recharge the bottles, irrespective of the size of the bottle. Annual unit maintenance and inspection costs, therefore, range from $700 to $2,100 depending on the airplane model.

Under certain combinations, some departures might be weight-constrained. In those cases, the additional weight of the fire detection and suppressions system will require an operator to off-load passengers or cargo. The cost of his off-load penalty is measured by estimating the number of displaced passengers or the amount of displaced cargo that cannot be accommodated. (On the basis of a statistical analysis of load factors and unaccommodated demand, the FAA estimates that 5 percent of the departures will be fully booked. Generally, most of these flights are not weight constrained, but this figure is a conservative assumption.) The cost of unaccommodated off-load--approximately $0.30 per pound -- is a weighted average of passenger and cargo revenue derived from revenue, enplanement, and freight data collected by the Bureau of Transportation Statistics, Office of Airline Information. Annual unit off-load penalties range from $30 to $800 depending on the airplane model.

Operators will also incur costs associated with flight diversions caused the false fire warnings. Costs include incremental airplane operating costs incurred during the diversion and passenger costs. Based on a recent FAA study of Service Difficulty Reports (SDR), proprietary aircraft operating data, and information from airborne fire detection equipment manufacturers, the FAA estimates that the frequency of false alarms is approximately 44 per million departures. In the absence of more detailed information, this analysis takes the conservative assumption that all false alarms result in a diversion. Annual diversion costs per airplane range from $60 to $2,800 depending on airplane type.

Based on the above, the FAA estimates total life-cycle costs for the retrofitted fleet in nominal terms are approximately $294 million, or $193 million at present value. For a newly-manufactured airplane delivered to an ATA carrier, the rule will increase life-cycle costs for an average affected airplane by approximately $110,000 in nominal terms, or $60,000 at present value. Unit lifecycle costs for a newly-manufactured airplane delivered to a non-ATA carrier will increase by approximately $179,000, or $100,000 at present value. (Per-airplane life cycle costs for ATA carriers are lower than for non-ATA carries since they are adjusted to account for voluntary installations of detection equipment. Similarly, estimated benefits for ATA carriers are adjusted -- that is, reduced -- to account for this voluntary action.)

Unfunded Mandates Reform Act Analysis

Title II of the Unfunded Mandates Reform Act of 1995 requires Federal agencies to assess the effects of any Federal mandate in a proposal or final rule that may result in the expenditure by State, local, or tribal governments, or by the private sector of $100 million or more in any one year. This rule does not contain a Federal mandate meeting that criterion, therefore the requirements of the Act do not apply.

Benefits Estimates

The benefits of detection and suppression systems depend on the degree to which the systems enable an airplane to avert a catastrophic accident in the event a fire occurs in a cargo or baggage compartment. Measuring this benefit, however, is problematic since it is determined not only by the relative fire-protection capabilities of Class C and Class D compartments, but on the probability that a fire will occur. Amendments to regulations -- e.g restrictions on the transportation of hazardous materials and more stringent burn--through requirements for compartment liners-also impinge on this analysis. (It should be noted, however, that the improvement standards for liners apply equally to both Class C and Class D compartments.)

The expected (future) rate of fires occurring in cargo or baggage compartments estimated using historical accident and incident data from the National Transportation Safety Board (NTSB), FAA, insurance underwriters, and foreign aviation authorities. These records show that during the 20-year period between 1977 and 1996, there were 19 fires reported as having occurred worldwide in Class D and Class C compartments involving transport category airplanes while used in commercial service. During this period, air-carriers worldwide (excluding domestic operations within the former Soviet Union, the Russian Federation, and the Commonwealth of Independent States) accumulated approximately 224.5 million departures in transport category airplanes having Class C or Class D compartments. The event rate for fires occurring in Class D and Class C compartments is, therefore, approximately 0.085 per million departures.

It must be noted that the event rate of 0.085 per million departures is based, for the most part, on service experience that occurred when consumer aerosol cans contained inert propellants. As described above under Background, the current use of highly-flammable propellants in consumer aerosol cans presents an additional hazard.

The available evidence shows that in the majority of incidents, Class D compartments successfully contain fires. Of the 16 inflight fires occurring in Class D compartments, only four were reported to have resulted in casualties or substantial damage to the airplane. A precise estimate of the likelihood of injury or airplane damage in the event a fire occurs in a Class D compartment is difficult to compute, however, owing to the limitations of accident and incident information. In many cases, necessary details had to be estimated. Where the post-event condition of the airplane is unknown, it is assumed that there was no damage. Where fatalities and injuries are unreported, it is assumed that there were no casualties. Where necessary, the number of occupants is estimated by applying the average load factor for that year by the average passenger capacity for a given airplane model.

The expected reduction in the proportion of occupants fatally injured in an accident resulting from a fire occurring in a Class D compartment is estimated as the ratio of fatalities to total occupants. Of the 1,411 individuals involved in the accidents cited above, 523 were fatally injured, representing approximately 37% of occupants.

Applying the risk reduction estimate above to airplane-specific departure, capacity, and load factor information (and using the statistical value of $2.7 million to represent the economic benefit associated with each fatality averted), FAA estimates that the rule will yield benefits of approximately $461 million over the life of the affected in-service fleet, or approximately $230 million at present value.

For a representative newly-manufactured airplane delivered to an ATA carrier, the FAA estimates that the rule will yield a life-cycle benefit of $280,000, or $94,000 at present value. For a newly-manufactured airplane delivered to a non-ATA carrier, FAA estimates that the rule will yield a life-cycle benefit of $340,000, or $115,000 at present value.

In view of the above, the FAA finds that the benefits of the rule justify its costs. Specifically, for the affected in-service fleet, discounted benefits will exceed costs by a factor of approximately 1.19. For affected newly-manufactured airplanes delivered to ATA carriers, discounted benefits will exceed costs by a factor of 1.57. For newly-manufactured airplanes delivered to non-ATA carriers, discounted benefits will exceed costs by a factor of 1.15.

The FAA believes there are also non-quantifiable benefits contained in this proposal, including increased consumer confidence in the aviation industry due to the installation of detection and suppression systems. The White House Commission on Aviation Safety and Security recommended that the FAA include these non-quantifiable benefits in evaluating safety proposals. The FAA took these non-quantifiable benefits into consideration while formulating the proposal.

Regulatory Flexibility Analysis

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by government regulations. Specifically, the RFA requires federal agencies to prepare a regulatory flexibility analysis for any rule that will have a ``significant economic impact on a substantial number of small entities." The purpose of this analysis is to ensure that the agency has considered all reasonable regulatory alternatives that would minimize the rule's economic burdens for affected small entities, while achieving its safety objectives.

Based on the initial Regulatory Flexibility Analysis and information received during the comment period, the FAA certifies that a significant number of small entities would be substantially affected by the proposed rule. In its preliminary analysis, the FAA concluded that there were no alternatives for small entities that could provide an equivalent level of safety at reduced cost. This conclusion was based on an exhaustive study of options that ranged from relatively low-cost, purely preventive approaches (e.g., banning certain types of material from air transport) to mitigative approaches such as: (1) retrofit of detection systems only, (2) a requirement for detection systems on newly manufactured aircraft only, (3) a requirement for detection and/or suppression systems for extended overwater operations only, (4) retrofit of detection and suppression systems, (5) a requirement for detection and suppression systems on newly manufactured aircraft only, (6) logical combinations of the above.

Based on information received during the comment period, the FAA determines that this conclusion is correct with respect to 14 CFR part 121 operations. There were no comments indicating that: (1) the rule would place small part 121 operators at a competitive disadvantage relative to large part 121 operators, or (2) that there were alternatives that could provide the same level of safety benefit at reduced cost to small operators. Significantly, no analysis was submitted indicating that fire safety risks for small part 121 carriers were different than for large part 121 carriers.

As noted earlier, however, the FAA is reconsidering the options for part 135 operators (most of which are small). Several commenters note that the FAA's economic analysis did not consider smaller turbojet airplanes operated in nonscheduled service under part 135. These commenters also observe that there are significant differences between nonscheduled part 135 operations and operations conducted under 14 CFR part 121. These differences, they claim, render the likelihood of an inflight cargo fire extremely remote.

The FAA agrees that further research is needed to evaluate the costs and benefits of detection and suppression systems for part 135 operators -- in particular, those engaged in nonscheduled operations involving turbojet airplanes originally designed for business travel.

A copy of the regulatory evaluation prepared for this project may be examined in the Rules Docket or obtained from the person identified under the caption FOR FURTHER INFORMATION CONTACT.